Heliacus (Grandeliacus) IREDALE, 1957
Heliacus (Teretropoma) ROCHEBRUNE, 1881
Heliacus (Gyriscus) TIBERI, 1867
Heliacus (subgen. nov.) [in press]

The remaining nominate genera are either only known as fossil forms, or are regarded as not available, as synonyms or as non-architectonicids.

A revision of the Indo-Pacific species of the family has reduced the number of species from more than 160 available names to 85 considered valid. Most of the species have a wide geographic range, some of them showing a continuous distribution from Africa to the American West coast. This can be explained by the long-lived teleplanic larval stages of architectonicids.

THE TROCHID GENUS *LIRULARIA* DALL, 1909: A FILTER FEEDER? James H. McLean, Los Angeles County Museum of Natural History, Los Angeles, California.

Lirularia is a small-shelled genus (shell height 3-7 mm) with variegated color patterns, associated with rock and algal habitats in shallow water. Seven species are known in the northeastern Pacific and two from the northwestern Pacific. It has long been known that the rhipidoglossate radula of *Lirularia* species is of the umboniine type with reduced shaft and cusps. Fretter (1975) showed that the gill of *Umbonium* is monopectinate, with greatly elongated filaments attached only at the base (unlike the monopectinate ctenidium of higher prosobranchs in which filaments are fused to the mantle skirt) and that the epipodial structures are modified to assist in filter feeding. For this study, a specimen of *Lirularia lirulata* (Carpenter, 1864), the type species of *Lirularia*, was relaxed in $MgCl_2$, removed from the shell, fixed in Bouin's, critical-point dried, and gold-coated for examination with SEM.

The gill of *Lirularia* resembles that of *Umbonium*, although there are fewer filaments. As in *Umbonium* (and other trochids), each filament has a prominent "sensory bursicle", as first described by Szal (1971). The frontal, lateral, and terminal cilia of the filaments are readily apparent when examined with SEM. A ciliated tract on the right side of the mantle cavity evidently functions as a food groove, where it is overlain by the tips of the filaments. The snout of *Lirularia* is broad like that of most trochids (unlike the narrowed snout of *Umbonium*), although the tip of the snout has a ringlet of small tentacles that lack sensory cilia; similar tentacles occur on the snout of *Umbonium*. The left neck lobe of *Lirularia* is digitate (as in many other trochids), not expanded to form a siphon enveloping the left cephalic tentacle, as in *Umbonium*. Unexpectedly, tufts of sensory cilia were found on the neck area, extending within the mantle cavity; similar structures were not found in four other trochaceans that were also examined with SEM.

The homology of the radula, gill filaments, and snout tentacles clearly indicate that *Lirularia* is related to *Umbonium* and should continue to be placed in the trochid subfamily Umboniinae. Field studies are needed to determine the importance of filter feeding in the feeding budget of *Lirularia*, as most other prosobranch filter feeders also have the capacity to ingest food in more conventional ways. *Lirularia* moves rapidly; it is unique among prosobranch filter feeders in being neither infaunal nor epifaunal and sedentary. The evolutionary origin of *Lirularia* is another problem: it could represent a step in the specialization leading to *Umbonium* or the return to a hard substratum of an infaunal umboniine.

***CLYPEOMORUS*, A GENUS OF LITTORINID-LIKE CERITHIDS. Richard S. Houbrick,** Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C.

The prosobranch genus *Clypeomorus*, dating from the Miocene, is endemic to the Indo-Pacific, and represents a major cerithiid adaptive radiation into intertidal hard substratum habitats. The genus is characterized by low spired, frequently beaded shells and all species are eurytopic, stylebearing herbivores, having taenioglossate radulae. Pallial gonoducts are open, males are aphallate and produce spermatophores. Development planktonic or nonplanktonic. Twelve living species are recognized: *C. bifasciata* (Sowerby), *C. brevis* (Quoy and Gaimard), *C. batillariaeformis* Habe and Kosuge, *C. pellucida* (Hombron and Jacquinot), *C. petrosa* (Wood), *C. purpurastoma*, new species, *C. inflata* (Quoy and Gaimard), *C. irrorata* (Gould), *C. nympha*, new name. Three subspecies, *C. bifasciata persica*, new subspecies, *C. petrosa chemnitziana* (Pilsbry), *C. petrosa gennesi* (Fischer and Vignal), and three fossil species, *C. verbeekii* (H. Woodward), *C. tjiolonganensis* (K. Martin), and *C. alasaensis* Wissema also are recognized.

THE EGG MASSES OF GASTROPODS FROM THE NORTHWESTERN RED SEA, A PROPOSED SCHEME OF THEIR CLASSIFICATION. Gamil N. Sollman, Department of Zoology, University of Cairo, Giza, Egypt.

The egg masses of more than 50 species of prosobranch and opisthobranch gastropods from the northwestern Red Sea have been described. As in most trochids (and most archaeogastropods in general) eggs are emitted singly in *Trochus dentatus*. The majority of gastropods, however, possess spawn masses of various forms. Shapeless gelatinous masses are possessed by some Turbinidae *(Turbo radiatus)*, but these acquire a globular shape in some Trochidae *(Trochus erythraeus)* and some Sacoglossa *(Elysia olivaceus)*. Soft horny capsules are incubated in the mantle cavity of female coralliophilids. Hard vase-shaped capsules are stuck singly or in groups in the neogastropod Muricidae *(Chicoreus virgineus, Murex ramosus)*, Thaididae *(Thais savignyi)*, Fasciolariidae *(Pleuroploca trapezuim)* and Conidae *(Conus sp.)*. The archaeogastropod Neritidae *(Nerita forskali)* lay small flattened hard isolated capsules. Eggs may further be deposited in coiled gelatinous ribbons which are either sand covered with coils one above the other (naticids), laid flat in the same plane with coils around the preceding ones (some dorid nudibranchs: *Chromodoris quadricolor, C. inornata, Gymnodoris limaciformis, Phyllidia varicosa*), or are attached edgewise (most nudibranchs and some Sacoglossa: *Phyllobranchillus orientalis*). Gelatinous egg strings

may be regularly coiled as in most aeolids (*Phyllodesmium xeniae*), or long and much entangled: sand covered (Strombidae) or free of any deposits (most Anaspidea).

An attempt has been made to classify the egg masses of the gastropods studied as well as those of other gastropods (including the pulmonates) into common types instead of dealing separately with the spawns of either the prosobranchs, opisthobranchs or pulmonates. This method helps to avoid false typifying of spawn morphologies among the Gastropoda and reduces the major types to only four. A better understanding of the reproductive biology of gastropods could be achieved by studying other aspects of reproduction of the three subclasses together in the way followed with their egg masses.

SYSTEMATIC REVISION OF THAIDID GENERA BASED ON ANATOMY. Silvard P. Kool, The George Washington University, Washington, D.C..

The status and validity of the thaidid genera *Thais* (Roeding 1798), *Purpura* (Bruguière 1789), *Nucella* (Roeding 1798), and *Mancinella* (Link 1807) were examined by study of the type species of each genus (*T. nodosa, P. persica, N. lapillus, M. alouina,* respectively). Five other species presently allocated to these four genera were studied as well.

Due to a high degree of convergence in shell morphology and considerable intra- and interspecific variability in shell shape, only anatomical and radula characters were considered. Twenty-five characters were taken from the reproductive system, alimentary system, and mantle cavity, and nine from radular morphology. Phylogenetic relationships are proposed based on a cladistic analysis using the Wagner 78 program. A phenogram was obtained using the PHYSIS UPGMA analysis.

This study indicates a clear distinction between *Nucella* and *Thais*, both considered valid genera herein. The genus *Mancinella* likewise deserves full generic status. The genus *Purpura, sensu latu,* is not monophyletic; thus the older generic name *Purpurella* (Dall 1871) should be resurrected for the Caribbean species, *P. patula*.

FANCY FOOTWORK: FUNCTIONAL MORPHOLOGY OF THE FOOT OF THE LIGHTING WHELK *BUSYCON CONTRARIUM*. J. Voltzow. Duke University, Durham, North Carolina.

Gastropods crawl, leap, burrow, mate, and catch prey using a single, flexible foot. The foot of *Busycon* is composed of a complex network of blood vessels, muscle fibers, and connective tissue. Near the pedal ventral surface, blood is channeled through discrete spaces delimited by the muscle and connective tissue of the sole. This musculature consists of a three-dimensional interwoven network of collagen-wrapped muscle fibers. Recordings of intramuscular pressure from the feet of *Busycon* reveal specific patterns of pressure fluctuations that correspond to the behaviors of resting, crawling and burrowing. Each pattern is the result of muscles antagonizing muscles directly and indirectly via the blood-muscle-connective tissue continuum of the sole. The special features of this continuum are responsible for the flexibility of the gastropod foot.

HATCHING SIZE VARIATION IN *NUCELLA LAPILLUS* ALONG AN ENVIRONMENTAL GRADIENT OF WAVE EXPOSURE. Ron J. Etter, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts

Embryonic development of many marine prosobranchs occurs within benthic egg capsules and the nourishment to sustain development is provided in the form of nurse eggs. Hatching size in these snails is dependent on the number of nurse eggs an embryo ingests during this period and is typically quite variable. Several hypotheses have been advanced to support the notion that interpopulation variation in hatching size is adaptive, although little direct evidence is available. One such hypothesis proposes that hatching size will be larger where environmental stresses are more severe. The intertidal snail *Nucella lapillus* was used to examine this hypothesis along an environmental gradient of wave exposure. Although the length and volume of egg capsules were similar among populations, the number of hatchlings emerging from capsules were positively, and their mean size negatively correlated with wave action. Intrapopulation variation in hatching size, in part, reflects differences in the number of embryos placed within egg capsules while variation between populations appears to result from differences in the number of nurse eggs deposited within capsules. Since shores protected from heavy wave action tend to experience more stressful conditions, both biotically and abiotically, these findings indicate hatching size varies in the predicted direction.

DIET AND THE CRYSTALLINE STYLE IN THE OMNIVOROUS NEOGASTROPOD, *ILYANASSA OBSOLETA* (SAY). Lisa C. Hendrickson, North Dartmouth, Massachusetts.

Temporal fluctuations in crystalline style wet weight and protein content were measured for the deposit-feeding omnivore, *Ilyanassa obsoleta*, to determine whether variations in style size are attributable to differential digestive responses, of mudsnails, to particular diets.

Mudsnails (12.0-14.0 mm) held in laboratory microcosms were allowed to feed, for one hour, on either a carrion or microalgal food source, following a five-day starvation period. A control group consisted of snails that remained starved throughout the experiment. Simultaneous measurements of style wet weight and protein content were collected for all three groups, and their corresponding normalized means were plotted over a 12-hour period.

Fluctuations in the mean style size of algae-fed snails reflected those of the control group, however, the mean style size of snails fed carrion did not change significantly during the experimental period. Further studies, which focus on the extracellular digestion of carrion, are being conducted.

SEASONAL VARIATION IN THE FREEZING TOLERANCE OF THE MARSH SNAIL *MELAMPUS BIDENTATUS*. D. R. Hayes and **S. H. Loomis,** Department of Zoology, Connecticut College, New London.